

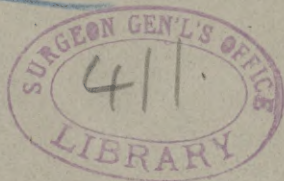
Blodgett (A. N.)
THE

Continuous Inhalation of Oxygen

*In Cases of Pneumonia Otherwise Fatal,
and in Other Diseases.*

BY

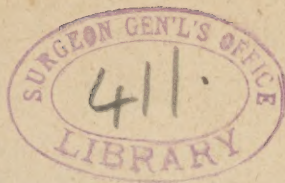
ALBERT N. BLODGETT, M. D.,
BOSTON.



*Reprinted from the Boston Medical and Surgical Journal
of November 20, 1890.*

BOSTON:
DAMRELL & UPHAM, PUBLISHERS,
283 Washington Street.
1890.

S. J. PARKHILL & CO., PRINTERS
BOSTON



THE CONTINUOUS INHALATION OF OXYGEN IN CASES OF PNEUMONIA OTHERWISE FATAL, AND IN OTHER DISEASES.¹

BY ALBERT N. BLODGETT, M.D., BOSTON.

It is a recognized fact that several of the most common and most fatal maladies to which the practitioner of medicine is called, are fatal on account of interference with the function of respiration. These diseases kill, by either preventing the access of a sufficient amount of respirable air to the lungs, or by diminishing the respiratory area within the lungs. This may be caused by exudation of foreign material, or from closure of the lumen of the respiratory passages through inflammation, or from other causes. It is only within the latest times, that the attention of the practitioner of medicine has been effectually called to the possibility of treating these conditions by the direct employment of oxygen, for the purpose of offering to the impaired respiratory function the means of fulfilling its mission to the animal economy, by extending to it an atmosphere containing a richer supply of this all-important element, thus enabling it to carry on its indispensable duty, though it be forced to do so by means of diminished or diseased respiratory apparatus.

The following paper is not intended to discuss this subject in an exhaustive manner, nor is it intended to enter into any examination of the ways or methods in which oxygen acts upon the tissues of the body, but its sole aim is to call the attention of the profession to the great benefit which we may secure for our patients

¹ Read before the Boston Society for Medical Observation, October 6, 1890.

from the use of oxygen in the treatment of disease ; and, to attract the notice of those enjoying large opportunities to its use, in the hope that their undisputed authority may indorse what, to my mind, constitutes a great advance in the treatment of some of our most intractable and most fatal diseases. The subject may be appropriately introduced by the narration of the following case :

Mrs. H. W., is a lady of nervous temperament, rather strong-willed, and has been married about six months, being at the present time about thirty-seven years of age. She has always been free from serious disease. She has had many harassing scenes in her family life previous to her marriage, and to some degree since that event. Is rather unusually strong and active in general.

On February 14, 1890, late in the day, I was called to see this lady, on account of a severe cough, which had been harassing her unremittingly for some days. The patient was found lying upon the outside of the bed, and very much flushed. The following symptoms were ascertained to be present. The cough, of which I had been told, was almost constant, and each paroxysm was accompanied by pain, as expressed by groans and exclamations, the distress being referred to an area covering the location of the lower lobe of the right lung. Over this area there was dulness, increasing to flatness as the lower border of the lung was reached, the respiratory efforts were painful, and exaggerated ; there was bronchial respiration over a large part of the affected area, and crepitant râles toward the upper portion of the same, with coarse, dry râles over portions of the chest adjacent. The temperature was elevated, the restless condition of the patient not admitting a positive record of the degree of fever, but the thermometer showed 101° F., taken under the

tongue. The pulse was somewhat variable, but averaged from 120 to 130 in the minute, of fair strength and volume. The face was mildly cyanosed, and the breathing though fairly free, was insufficient, the respirations being twenty-four in the minute. Two days before, there had been a chill, or rather a chilly sensation of considerable duration, which had been followed by heat and headache, which has since persisted. There was almost complete anorexia, due to nausea. The bowel had been thoroughly evacuated of its contents by domestic purgation. The skin was hot and dry, the color of the surface mildly dusky, the eyes bright and staring, the tongue dry and rough, with many superficial fissures. The teeth were moderately covered with adhesive gummy material. Herpes labialis present. The lips were dry and parched, though not fissured or cracked. There was no expectoration, though there was the constant desire to get something up, which caused, to some extent, the troublesome cough. There was constant pain in the right side, referred to a point of greatest intensity about the region of the nipple, from which it radiated in various directions, and extended around the side. There was no tenderness or other disturbance of the digestive organs, except the symptomatic phenomena above mentioned.

An anodyne mixture was given to relieve the intensity of the cough, and to aid in expectoration; and quinine, with a little wine, was ordered four times daily. Liquid diet was prescribed, and the patient was enjoined to remain quietly in bed, in the hope that the morbid process would remain confined to the portion of the lung already affected.

On the next day, February 15th, the patient was found vastly more comfortable. Cough was greatly relieved, and the night had been restful and she was much refreshed. Treatment was not changed, and the directions before given were continued.

February 16th. I was hastily summoned early in the day, and found the patient in a most alarming condition. There was great oppression in breathing, the surface was everywhere deeply cyanosed, and the respiration was hurried and difficult. The cough had again become distressing; there was a constant feeling of impending suffocation; and the patient was restless, and agitated by the apprehension of sudden dissolution. The face was of a deeply livid color, conjunctivæ were injected and dusky, and the tongue was heavily coated with a brownish layer of offensive character. I found that on the previous day, she had been out of bed, had attempted to arrange the room, had been sitting at the window, and had been chilled while thus engaged. During the night she had become rapidly worse, so that her condition had awakened alarm in those about her. The area of dulness was found to be more extensive, now including almost the whole of the right lung, and the lower portion of the left, the dulness on this side reaching as high as the nipple. The process in the base of the right lung seemed to be in about the same condition as before described, and there was no noticeable tendency toward resolution. Bronchial respiration was everywhere detected in the territory of dulness or flatness, and abundant fine crepitation was heard. Temperature was 103° F., respiration 30, pulse 120.

Milk was directed in two-ounce draughts every two hours, and digitalis was ordered, as the circulation was evidently but imperfectly carried on. Tincture of nux vomica in five-drop doses was ordered every four hours, in the hope that it might act to stimulate the respiratory powers. Brandy in moderate amount was also advised, and a competent nurse was obtained, to whose efficiency and care are no doubt attributable the successful issue of what was during many

hours by far the most desperate condition which I have seen end in recovery. In the afternoon the temperature was 102.6° F., the pulse 120, and the respiration 35. The patient was very restless and much harassed by a short, dry cough. It was difficult to persuade her to take food. At 7 P. M., there were signs of collapse, the pulse became very weak, the respiration sighing in character, the extremities cold, and the intelligence clouded. A mustard plaster was applied to the chest with benefit, and digitalis and brandy given with a little hot milk. After an hour the signs of extreme peril were relieved to some degree, and the patient turned on the side and slept for twenty minutes. The night on the whole was quiet but not restful, the patient having several paroxysms of coughing, in each of which the surface became livid, and the signs of asphyxia again appeared.

February 17th, at 6 A. M., pulse was 134, respiration 40, temperature 99.8° . The cheeks were quite livid, but there was no evident great distress in breathing. A considerable amount of urine was withdrawn by catheter. At 11 A. M., temperature 100.8° , pulse 120, respiration 52 and somewhat labored. Mustard was again applied to the chest, with some improvement in the respiration; and the patient slept at intervals. At 6 P. M., temperature 102.4° , pulse 126, respiration 45. The patient was now showing unmistakable signs of exhaustion, and the feebleness of the heart's action was apparent. Consultation was suggested, but declined.

At this time I advised the use of oxygen gas, in the hope to increase the respiratory function by furnishing the limited lung-area with an augmented amount of oxygen, so that the condition of the circulation might be improved, and possibly the constant apprehension of asphyxia be relieved. I cannot say that I looked

for any permanent good from it, but I hoped to at least gain for the patient the comfort of euthenasia. The gas employed was diluted with ten per cent. of nitrous oxide, and in this form caused no appreciable sensation of discomfort to the patient. The amount given was limited to a few gallons, the exact quantity not being ascertained, owing to a leak in the holder, but the effect was soon noticeable in the appearance of the patient, who became much more quiet, and was relieved to a great degree of the embarrassment in respiration. The face soon became less dusky, the conjunctivæ clearer; the intelligence of the patient was much benefited, and she expressed herself as feeling better. The oxygen was now withdrawn, and the patient fell into a gentle sleep.

February 18th, at 3 A. M., temperature 97.8°, pulse 122, respiration 52. Face was again very dusky, and patient wandering and restless. Oxygen was again administered, in the manner described above, and again the patient seemed to derive benefit from its use.

At eight o'clock the extremities were cold, the respiration labored, the mind wandering, the body was covered with a clammy sweat, the skin was relaxed, the eyes dull, and every symptom of rapidly approaching dissolution was stamped upon the case. At this time I directed the continuous employment of oxygen, as the only means of prolonging life, and averting the paroxysms of distress which recurred at intervals. The gas was conveyed from the tank in which it is supplied through a wash-bottle directly to the mouth of the patient, and a constant stream of gas was flowing through the tube all the time, so that with each of the rapid respirations the patient was obtaining a constant increased amount of oxygen. This method of administration, of which I have thus far found no account in the means of information at my command, seemed to afford considerable

relief in a short time, and after watching the case for an hour, I left, giving directions to continue the gas.

At 11 o'clock the respirations were higher than at any time heretofore, being 64 in the minute, and the pulse 144; but the patient was not only conscious, but was not particularly uncomfortable, and certainly suffered no such distress as was the case with a much lower frequency of respiration, only a few hours before.

At 6 P. M., the pulse was 120, respiration 56, temperature 98.2° , and the condition of the patient was, on the whole, more satisfactory. The patient took food, and the cough had become less harassing, and there was a noticeable loosening, and the indication of approaching expectoration.

February 19th, 7 A. M., pulse 160, respiration 60, temperature 97.4° . The night was rather restless, the patient was delirious, the extremities became very cool, and were livid in color, the veins of the neck were turgid, and the appearance less favorable, but this condition improved with the morning, and she became quiet and again seemed better.

She continued in this way during the day, until the afternoon visit at 5 o'clock, when the supply of oxygen unexpectedly gave out. A new supply was at once ordered, but the patient sank rapidly, and seemed to be dying. She passed into a state of collapse, the pulse became imperceptible, the color was more livid than at any previous time, the respirations became shallow, and were reduced to sixteen in the minute, the eyes were glazed, clammy sweat burst forth over the entire body, and every sign of immediate dissolution was present. A subcutaneous injection of pure brandy was at once given, which was followed by a temporary improvement in the pulse and respiration, but this soon subsided; a second injection of the same character

was given, with a less perceptible effect, and at the time when it seemed that the patient was irrecoverably lost, the oxygen arrived. The gas was at once conveyed into the patient's mouth, and mechanical aid was given to assist the respiratory movements. For a time there was no appreciable benefit from the gas, but gradually the color of the surface improved, the respiration was less embarrassed, the patient could swallow, and the immediate symptoms were again relieved. The patient was, however, restless, the extremities were cold, and efforts to revive the temperature were only partially successful. The pulse remained at 140 most of the night, and the temperature was subnormal. The respirations fluctuated to some extent, but remained between 44 and 58 to the minute.

February 20th. At 7 A. M. the temperature was 96.8° , the pulse 120, and the respiration was irregular, on account of the violent efforts of the patient to get out of bed, etc. At noon, pulse was 134, respiration 56. Strychnia (one-sixtieth of a grain) was ordered every four hours, in the hope to invigorate the respiratory efforts. In the afternoon the temperature was 99.2° .

February 21st. The temperature, although falling to 96.8° in the morning, recovered to 98.8° , pulse 120, and the general condition of the patient was satisfactory. She was able to sleep at intervals without the use of anodynes, and there was a gradual improvement in the strength. Enemata were employed to relieve the bowel, followed by considerable exhaustion. The respiration continued about 50 in the minute, but the condition of the patient was on the whole much more satisfactory. At night the respiration again rose to 60 in the minute, but there was no distress. There was now considerable expectoration, and later in the day the bowels and bladder were

moved spontaneously for the first time during the severe phase of the illness.

February 22d. The breathing was less labored, and the patient, in this way, more comfortable than at any time during her sickness. Temperature in the morning normal, in the afternoon 100° . At 8 P. M. pulse was 100, respiration 32. The bowels acted naturally.

February 23d, 8 A. M., temperature 98.2° , pulse 94, respiration 36. Passed a fair, though not a very restful night. Began to raise large masses of tenacious matter from the lungs. At 3 P. M., the oxygen was discontinued *after continuous administration for a period of 106 hours.*

February 24th, at 7 A. M., temperature 99° , pulse 92, respiration 30. At 6 P. M., temperature 97.6° , pulse 96, respiration 35, and the patient was perspiring freely. She passed a good night, and awoke refreshed and strengthened.

February 25th, 7 P. M., temperature 98.8° , pulse 96, respiration 28.

From this time there was an uninterrupted convalescence from the pulmonary disease, though the progress was not rapid, and was delayed by neuralgic attacks in various parts of the body, which, at length, however, subsided. There was prolonged mental enfeeblement, caused perhaps by the extreme gravity of the disease, which has since gradually cleared up, so that the patient, in all respects, is, at present, apparently as well in both body and mind as before her sickness.

It will be noticed that coincident with the continuous administration of the oxygen there was a remarkable and enormous fall of the temperature. The thermometer registered on the afternoon of February 17th, 102.5° . At this time the patient sank into a state of profound collapse, and the thermometer registered at the next visit, 97.4° , a fall of 5.1° within a very short time.

The condition of the patient was, during many succeeding hours one of the greatest gravity, there was little tendency to rally, and for several days the morning temperature was subnormal.

On one occasion, with subnormal temperature there was associated a pulse of 160 in the minute, and a respiration of 56. Upon two occasions during the severity of the case, the lines of temperature and pulse cross each other, that is, a rising pulse line is found associated with a declining temperature, a phenomenon which has been believed to be invariably indicative of a lethal termination of the case.

I account for these various unusual symptoms upon the ground of the extreme exhaustion of the patient, and the great prostration of all the vital processes.

I have thus, somewhat at length, detailed this case in the hope that I might bring to my aid the experience of other and abler men in the use of the meaus here employed for combatting the asphyxia accompanying pneumonia, and, which I have no doubt, is equally applicable to other diseases which kill by reducing the respiratory capacity of the lungs, or by preventing the elimination of noxious products of respiration. I have been able to find very little in the literature upon this subject, and have never seen or heard of the use of oxygen in any other, than rather an experimental and dilettante manner in the treatment of disease. When I directed the continuous administration of the gas, I did so under the positive conviction that the patient was irrevocably doomed, and the best result that I looked for, was simply relief to the sensation of suffocation, and not any curative action. The record then made in my note-book, February 18th, at 8 A. M. is "in articulo mortis." At this time I had only employed the gas in the manner ordinarily directed, that is, two or three gallons at a time, several

times daily. I now directed its use without cessation, and to my great surprise, the patient not only obtained the relief desired, but was enabled to carry on the function of respiration.

The amount of gas employed was not far from two hundred gallons in twenty-four hours. The dealer who supplied the gas was astonished at the amount required, and, thinking to do me a service, sent me a cautionary message, implying that no human being could possibly stand so great an amount of oxygen, on account of the dangerous degree of stimulation to the system and the increased combustion of tissue. I have no doubt that the warning might be appropriate in any ordinary or occasional use of the gas, but in this case, the temporary absence of the oxygen was followed by the most alarming symptoms, and it was only with the greatest exertion that the patient was resuscitated. I think that the recovery of the patient from the condition in which she then was, is due entirely and unquestionably to the administration of the gas. Its effect was almost as pronounced and evident as is that of a ligature in hæmorrhage.

To my sorrow I have to confess that I am able to recall more than one case of pneumonia which has terminated in death, in which I cannot but think that the timely use of oxygen gas might have been conducive toward a different ending of the disease. I am inclined to think that the judicious employment of this agent will be followed by distinct amelioration of the symptoms, and reduction of the distress in all cases of impending asphyxia. If in this way the strength of the patient may be husbanded, and the blood be maintained in a state of oxidation sufficient to allow the respiratory phenomena to go on, I think that many cases will be found in which the period of greatest danger may be safely tided over, which would otherwise unquestionably be lost.

I have been able to find only very rare and unsatisfactory allusions to the use of oxygen in pneumonia, and what I have found are almost wholly without benefit in forming a conclusion as to the best manner of using this agent, and also in relation to its action. I have only found one allusion to the continuous administration of oxygen, and in this case the gas was conducted into a pail of water, placed by the side of the patient's bed, and the air of the room was fanned toward the patient. I think it may well be questioned how much benefit was derived by the patient from this uncertain method of administration of the gas, though I believe that in this case the patient happily recovered. I had not seen the report of this case, and it is so unsatisfactory that I should hardly have been inclined to accept it as a safe guide in the use of what was to me an unknown method of administration.

I shall not at this time attempt to analyze the action of oxygen upon the organism, nor the way in which it changes the condition of the patient, but will simply express my conviction that its employment in the laboratory for physiological experiment does not at all indicate its usefulness or its action upon the organism in cases of disease. I feel that in extreme dyspnoea, or in threatened asphyxia, we have in this agent the means of obtaining in many cases a distinct relief of the suffering; and a painless if inevitable death. If more extensive experience should confirm my present conviction, we have in oxygen the means of tiding the system over periods of great exigency in the direction of suffocation; and the chances of recovery in such cases are raised from absolutely nothing, to a very considerable proportion.

In my opinion, the *first* of these propositions would be a sufficient reason for urging the use of any appropriate agent; and the *last* makes its use in proper

cases imperative. It is none the less indicated, and acts in these cases in exactly the same way as in cases of poisoning from illuminating gas, in drowning (submersion), in carbon-dioxide poisoning, and in other conditions which will present themselves to the mind.

A somewhat imperfect review of the literature upon the subject of the employment of oxygen in the treatment of pneumonia has not afforded the assistance which I hoped to obtain, and I am convinced that it is not the subject of frequent administration. The "Index Medicus" has relatively few allusions to it, and the cases there recorded are either imperfect to a degree which deprives them of all value as articles of reference, or are so purely amateurish in character that no useful deductions can be made from them. Dr. Maurice Dupont² states that oxygen was first used by Dujardin-Beaumetz, and adds that the indication for oxygen inhalation is most pronounced in asphyxia. Beddoes has employed oxygen for the relief of asphyxia after submersion. Paul Bert has recommended the use of oxygen to aeronauts in making ascents into great altitudes, where the atmosphere is relatively attenuated, and the contained oxygen much rarified. The concomitant asphyxia attending these ascensions is best combatted by oxygen gas. A case is mentioned in which the asphyxia due to attenuation of the atmosphere was so sudden and so profound, that two of the three occupants of the balloon were overpowered before the necessary preparations for inhalation could be made, and only one individual survived the perilous adventure.

Crequy has reported several cases of profound suffocation from carbon-dioxide which have been promptly relieved by oxygen. "This is advantageously combined

² Bull. Man. de Ther., vol. cxvi, p. 258.

with injection of ether, or ether vapor may be mingled with oxygen gas. Inhalations of oxygen have been of vital importance in poisoning from illuminating gas, which is less amenable to treatment than is the more ordinary form of poisoning from carbon-dioxide. It has been found of great service in the treatment of persons overpowered by the unwholesome or poisonous gases of vaults, sewers, mines, etc. The uses of oxygen apply solely to a single symptom, the dyspnœa; in cases of functional disorders of the respiratory system, or of asphyxia, in some cases acute, as in carbon-dioxide poisoning, or chronic, as in pulmonary congestion from incompetency of the cardiac valves or muscle."

Dr. J. H. Davenport³ states: "The cases in which oxygen is of benefit are conveniently divided into three classes: (1) those involving dyspnœa, which are essentially acute; acute stages of Bright's disease, heart disease, uræmia, opium-poisoning, etc.; (2) those involving defective nutrition or excretion, which are chronic. Oxygen here acts as a tonic. It has in this way been found valuable in phthisis, emphysema, acute dyspepsia, anæmia, etc. The amount usually employed and directed is three or four gallons daily, at considerable intervals; (3) in certain spasmodic diseases." The paper above quoted is a valuable contribution to the study of oxygen in general, but it presents no cases, and touches only to the extent above indicated upon the use of oxygen gas in the manner and for the object to which the present paper is devoted.

Dr. W. Gilman Thompson⁴ gives the following summary of uses of oxygen gas: (1) In neurotic dyspnœa; (2) when there is diminished surface for

³ Boston Medical and Surgical Journal, vol. lxxxvii, p. 61.

⁴ New York Medical Record, vol. xxxvi, p. 1.

aeration of the blood ; (3) diminished inflation of lungs from many causes ; (4) specially beneficial in the dyspnœa of chronic Bright's disease, uræmia, pneumonia, capillary bronchitis, asthma, catarrhal bronchitis, sometimes pulmonary congestion, and early stages of œdema. This article has also a very carefully collected list of the published articles bearing upon the topic under discussion.

Sajous⁵ writes : " Griffith states that Dr. F. Glasgow⁶ administered oxygen internally to a patient with pneumonia, and observed decided improvement in the color of the skin, and in the general appearance."

Hilton Fagge in his concise and valuable work, does not mention oxygen in relation to pneumonia. In critical periods he recommends alcohol, ammonia, and sometimes cautious venesection.

Certel⁷ says : " The employment of oxygen inhalations seems to me most justified scientifically in cases in which the relative pressure of the oxygen is considerably lowered, and in maladies attended with dyspnœa, in which the blood is overcharged with carbonic acid. Paul Bert was the first to demonstrate by experiments on animals as on the human subject, that in attenuation of the air down to 450 to 400 millimetres of the barometer, the symptoms of oxygen insufficiency are set up, but by the inhalation of more richly oxygenized air, a further reduction of the pressure can be borne. Under pathological conditions, arrest of the diffusion of oxygen from the lung into the blood, may give rise to a similar diminution of the pressure of the oxygen of the blood as does the lowering of the relative pressure of that gas in the atmospheric air. In such cases an increased supply of oxygen will in the same way

⁵ Annual of the Universal Medical Sciences, 1889, p. 114.

⁶ Weekly Medical Review, February 25, 1889 (?).

⁷ In the article on Respiratory Therapeutics, in v. Ziemssen's " Handbook of General Therapeutics," vol. iii, p. 243.

avert the immediately threatened danger, although it exercises no direct influence upon the cause which gives rise to it. Accordingly we find indications for the use of oxygen inhalations in those diseases of the respiratory organs which are attended with severe dyspnoea due to defective exchange of gases, and consequent accumulation of carbonic acid in the blood, such as acute exacerbations of chronic catarrh, emphysema, asthma attended with cyanosis and dyspnoea, in which, according to the published reports [Birch-Ascherson] oxygen inhalations arrested the dyspnoeic attacks, often when they had assumed a most dangerous form. Hitherto, however, there are no published records which furnish any satisfactory account of the extension of the use of oxygen inhalations (*vide* Waldenburg)."

In a short article by Dr. E. C. Titus⁸ the author states that "in pneumonia it should be administered continuously from three to five minutes, and as frequently as the urgency of the case demands." He also states that "it has been found by clinical experience that oxygen is less irritating and more readily absorbed when combined with a certain equivalent of nitrogen monoxide. The proportion that I have found most valuable is two parts pure oxygen and one part nitrogen monoxide. In order to obtain good results it is of the utmost importance that these gases should be absolutely pure and properly combined. Pure oxygen I believe to be too powerful an oxidizing agent when used alone, especially when there exists inflammation of the air passages." . . . "Nitrogen monoxide is valuable as a modifier of pure oxygen, and has a soothing effect upon the nervous system. It renders the oxygen

⁸ Published in the New York Medical Record, October 5, 1889, upon "A few Clinical Cases showing the Value of Oxygen combined with Nitrogen-Monoxide, in the Treatment of Pulmonary and other Troubles."

with which it mingles more assimilable, and hence more promptly available in the general system."

He reports the following case: "A gentleman, aged sixty-three, of robust habit, was taken ill with double pneumonia. Recognizing the case to be of extreme gravity, because of the rapid respiration and the early development of delirium, with a rapid, feeble and irregular pulse, I immediately began the use of oxygen and nitrogen monoxide, with stimulants and other remedies. At first the inhalations were given very frequently, as often as every fifteen or twenty minutes, and for a period of from three to five minutes at a time. After using a few times, the patient became more quiet, the breathing easier and less rapid, with clearing up of the cyanosis, abatement of the delirium, and free expectoration. The remedies were continued through the night. The following forenoon the patient expressed himself better, and very much relieved by the inhalations. The inhalations were continued through the course of the disease, at either longer or shorter intervals, as the exigencies of the case demanded, and were always followed by an amelioration of the urgent symptoms."

The last-mentioned quotation is taken from an ostensible reprint of the paper referred to, published by a company in New York as an advertisement for oxygen, which is furnished by the company in large steel cylinders containing one hundred gallons. Oxygen is also offered to the profession in the quantity of one hundred gallons, contained in small wrought-iron cylinders, under enormous pressure. In my limited experience the gas from the larger cylinders has seemed to last longer, and I thought the patient seemed to obtain more benefit from its use than from that in the smaller cylinders. In both cases the oxygen is diluted with a certain amount of nitrous oxide gas.

EXTRACTS FROM THE DISCUSSION.

DR. F. C. SHATTUCK : My interest in the therapeutic use of oxygen has been awakened especially within the past year, and I am much struck by Dr. Blodgett's communication, and the valuable suggestion which it contains. It is my impression that oxygen has been used much more in New York, Philadelphia, and perhaps some other cities, than in Boston; and I had supposed the literature of the subject to be less meagre than Dr. Blodgett has found it. My personal experience with oxygen in pneumonia is limited to two cases; one seen in consultation, the other in hospital practice; both were fatal. The gas was given at intervals in doses of ten gallons or less. I think the tendency has been to wait till the case seemed pretty desperate before using the gas, and Dr. Blodgett's experience would lead one to think that far larger quantities should be used. It would appear that on the other side of the water eighty gallons daily is frequently used in cases of different kinds. Indeed, Ephraim¹ states, in his little monograph, that an objection has been raised against the use of such small doses as the above. "When the average daily consumption of oxygen," it is said, "is five hundred gallons, is it not absurd to expect notable results from the administration of eighty?" One obstacle which the therapeutic use of oxygen has had to encounter lies in the attitude of physiologists toward it, and the doctrine that an individual takes from the atmosphere all the oxygen which he is capable of consuming, the percentage of the gas in the ordinary atmosphere leaving a wide margin of safety. In the monograph to which I have alluded, this question is discussed, and recent experiments are brought forward to show that the inhalation of in-

¹ Berliner Klinik, 1890.

creased quantities may be followed by increased consumption. From a scientific point of view, this is the crucial test. But that which obtains in physiological does not necessarily hold true in pathological conditions, and clinical experience would seem to show that oxygen inhalations may be of distinct value. A second obstacle is the expense of, and, oftentimes, the difficulty in obtaining the gas; at ten cents a gallon, the former is considerable. Last winter, following a suggestion of DaCosta, I used the gas in a case of pernicious anæmia, and in another of leukæmia. The former patient was steadily going down hill until the oxygen was begun—ten gallons two or three times a day. From that moment improvement set in, and was very marked. The blood was restored almost to its normal condition as far as the count went; and the complexion, from lemon yellow, became ruddy. The gas was omitted, the patient relapsed, and failed again to improve, though the gas was resumed and in larger quantities. In the case of leukæmia no benefit followed several weeks' trial.

In conclusion I should like to emphasize the fact that this hint of Dr. Blodgett's of the continuous administration of the gas, in just such cases as he reports, is likely to be of great value.

DR. BLODGETT: I presented this paper not as a finished treatise on this subject, but in order to induce those who know more about the use of oxygen than I do to give me, and possibly others, the benefit of their experience, and I am much gratified at the result. As far as the kind of gas is concerned I cannot speak definitely. I used both the varieties mentioned because one source of supply became exhausted. It is my impression that the larger cylinders are more economical and last longer than the smaller ones. In cases of severe pneumonia I cannot see the efficacy of

giving a small amount of oxygen, and then allowing a considerable interval to elapse before a repetition of the gas. It would seem to me to be like a stimulation, which must be followed by a depression, and the change from temporary stimulation to depression, I should fancy would be more severe at each recurrence; and for that reason I am inclined to consider the continuous administering of oxygen in quantities adapted to the emergency as having a marked advantage over its intermittent administration in even larger quantities. The fact that it worked so very pleasantly, without any disagreeable after-effects in the case reported, has made me feel bold to use it in the same way again. Allusion has been made to the laboratory uses of oxygen, and the deductions of physiologists from that standpoint. I am satisfied that laboratory experiments in this respect do not furnish a reliable guide for the employment of oxygen in pathological conditions. It is very likely that the effect produced by the administration of oxygen to a perfectly healthy subject might be entirely different from what I observed in its administration under circumstances in which the respiratory area of the lung was seriously diminished. In many cases of this character, death occurs simply from *lack of oxygenation*, and is accompanied by all the features and signs which indicate that condition. I did not expect recovery in this case, yet I should more confidently expect it in another case of similar character and gravity, if there were no other serious pathological condition than the simple occlusion of lung-tissue. If that condition has not gone too far and is essentially free from serious complications, I cannot see why the administration of oxygen cannot be confidently adopted as the method which offers the best results with which I am acquainted. The pneumonic condition under ordinary circumstances

is self-limited, and will clear itself in a fairly defined time, and if we can only tide the patient over this critical period, we may, it seems to me, confidently hope for cure in many patients who otherwise must inevitably die; I mean those cases in which the diminution of oxygen in the circulation becomes so pronounced that all the appearances of asphyxia are produced, and in which the patient dies solely or chiefly from that cause.

— THE BOSTON —
MEDICAL AND SURGICAL JOURNAL.

A FIRST-CLASS WEEKLY MEDICAL NEWSPAPER. PUBLISHED EVERY THURSDAY.

Two Volumes yearly, beginning with the first Nos. in January and July. But Subscriptions may begin at any time.

This JOURNAL has been published for more than sixty years as a weekly journal under its present title. Still it is incumbent upon this JOURNAL, no less than upon others to assure its patrons from time to time, as the occasion arises, of its desire, ability, and determination to meet all the requirements of the most active medical journalism of the day, without sacrificing any of that enviable reputation which is an inheritance from the past.

It is under the editorial Management of Dr. George B. Shattuck, assisted by a large staff of competent coadjutors.

Communications from all quarters of the country are acceptable. Liberal arrangements are made for reprints of original articles, and for such illustrations as serve to increase their value or interest.

All editorial communications, and books for review, should be addressed to the Editor.

Subscriptions and advertisements received by the undersigned, to whom remittances should be sent by money-order, draft, or registered letter.

Terms of Subscription : In the United States, and to Canada and Mexico, \$5.00 a year in advance. To Foreign Countries embraced in the Universal Postal Union, \$1.75 a year additional. Single numbers, 15c. Ten consecutive numbers free by mail on receipt of \$1.00.

Sample copies sent free on application.

PUBLISHED BY DAMRELL & UPHAM,

283 Washington St., Boston.

